



## WHAT IS CLAIMED IS:

亢 A fiber optic modulator system, comprising:

an optical source;

a first polarization maintaining (PM) coupler for splitting a signal received from said source into two optical paths, said two paths forming a Mach Zender Modulator (MZM);

a phase modulator disposed in a first optical path;

a piezo-electric transducer (PZT) disposed in a second optical path;

a second PM coupler for recombining said first and second optical paths; and

a detector for detecting the output from said second PM coupler.

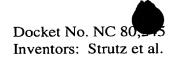
2. The system of claim 1 further comprises:

a fiber tap for sampling output from the second PM coupler;

a d.c. photodetector for detecting the output of said fiber tap; and

a phase locked loop (PLL) system disposed to receive a signal from said d.c. photodetector, said PLL system providing a feedback signal to said PZT for controlling the relative phases of said first and second optical paths.

- 3. The system of claim 2 wherein said PZT controls the optical path length of said second optical path.
- 4. The system of claim 2 wherein said phase modulator is made of lithium niobate (LiNbO<sub>3</sub>).
- 5. The system of claim 4 wherein said phase modulator imprints an analog signal into said first optical path for modulating a signal from said optical source.





- 6. The system of claim 5 wherein said phase modulator enables phase modulation of signals in said first optical path by an RF signal, the phase modulation being detected by said second PM coupler.
- 7. The system of claim 6 wherein said phase modulator maintains optical polarization of signals from said optical source.
- 8. The system of claim 7 wherein said optical source is a diode pumped Nd:YAG ring cavity laser.
- 9. The apparatus of claim 2 further comprises: erbium doped fiber amplifier disposed in said first optical path between said phase modulator and said second PM coupler.
- 10. The apparatus of claim 2 further comprises:a second phase modulator disposed in said second path.

11. In a fiber optic communication system having at least one fiber optic modulator, a method of enhancing the performance of the communication system comprising: fiber optic links comprising the steps of:

providing an optical source;

splitting signals from said optical source into first and second paths, said first and second paths forming a Mach-Zender Modulator (MZM) cavity; phase modulating the signals in said first optical path; controlling optical path length of said first and second paths; combining the signals in said first and second paths; and detecting the combined signals.

12. The method of claim 11 further comprising: sampling the combined signals; detecting the sampled signals; and Docket No. NC 80,2-3 Inventors: Strutz et al.



controlling the relative phases of said first and second paths.

- 13. The method of claim 12 wherein said phase modulator is made of lithium niobate (LiNbO3).
- 14. The system of claim 12 wherein a LiNbO<sub>3</sub> modulator modulates the signals in said first optical path.
- 15. The method of claim 12 further comprising:

inputting an analog signal to control the modulation of signals in said first path.

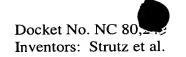
- 16. The method of claim 12 further comprising: imprinting an analog RF signal onto said first path; and controlling the length of said second optical path.
- 17. The method of claim 12 further comprising:

disposing a second phase modulator in said second path to allow for dual drive modulation.

- 18. The method of claim 11 wherein the output of said second PM coupler is detected using a plurality of photodetectors.
- 19. The method of claim 20 wherein the outputs of said photodetectors are subtracted to implement a balanced detection scheme.
- 20. A fiber optic link system for transmitting signals from a source to a destination having a fiber optic modulator, the fiber optic modulator comprising:

an optical source;







a first polarization maintaining (PM) coupler for splitting a signal received from said source into two optical paths, said two paths forming a Mach Zender Modulator (MZM);

a phase modulator disposed in a first optical path;

- a piezo-electric transducer (PZT) disposed in a second optical path;
- a second PM coupler for recombining said first and second paths; and
- a detector for detecting the output of said second coupler.

## 21. The system of claim 20 further comprises:

a fiber tap for sampling a portion of the output of said second coupler;

a d.c. photodetector for detecting the output of said fiber tap; and

a phase locked loop (PLL) for receiving a signal from said d.c.

photodetector and providing a feedback signal to said PZT to control the relative phases of said first and second paths.

